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ABSTRACT

This teacher's guide accompanies three student manuals and together with them comprises an instructional package on the lubrication system in the Small Engine Repair Series for handicapped/special needs students. The first section, "Notes to the Instructor," covers equipment needs, preparation before teaching the instructional package, student evaluation, visual aids, and use of audiovisuals and student manuals. Student prerequisite skills and suggested activities are then listed. Student goal and objectives are arranged to assist the teacher in the development of individual instructional plans. Activities and materials are suggested to help students achieve these objectives. These additional resource materials are then provided to support the various teaching methods: a listing of vocabulary terms, transparency masters, answers to review materials in the student manuals, an evaluation model, and narratives for two audiovisual presentations (not available here). A list of references is attached. (YLB)

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SMALL ENGINE REPAIR SERIES

ED221760

LUBRICATION SYSTEM

Teacher's Guide

Prepared by Pamela Hill

Published by
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FIRST EDITION
1981

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TEACHER'S GUIDE

FOR

LUBRICATION SYSTEM

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PREFACE

LUBRICATION SYSTEM, an instructional package in the Small Engine Repair series, was developed, field-reviewed, and evaluated by vocational industrial teachers who teach handicapped students about repairing small engines. This material was developed as an extension of Comprehensive Small Engine Repair by the Mid-America Vocational Curriculum Consortium, Inc., and we recommend the two be used together.

This project, now in its second year, was initiated in 1979 because it was felt that special needs students enrolled in General Mechanical Repair programs in Texas needed more appropriate instructional materials to aid their learning. The aim of this project has been twofold: (1) To task analyze the typical repair jobs of small engines and then identify the minimum required information, safety, and work habits associated with each repair job; and (2) To present this material in a variety of ways that are consistent with learning styles of special needs students with cognitive dysfunctions--primarily, the mentally retarded and learning disabled.

LUBRICATION SYSTEM is desigend with a combination of different media approaches--audio, visual, and hands-on. It is anticipated that this balanced multimedia approach will not only provide an opportunity for students to experience learning from different angles, but will also make learning more interesting and easier. Included in LUBRICATION SYSTEM are the following instructional materials:

Audiovisuals:

1. Check and Change the Engine Oil
2. Service the Crankcase Breather

Student Manuals:

Introduction: Things For You To Know
1. Check and Change the Engine Oil
2. Service the Crankcase Breather

Teacher's Guide: LUBRICATION SYSTEM

Audiovisuals

The two audiovisual presentations portray typical lubrication repair jobs that are frequently performed in a small engine repair shop. The presentations are available in either filmstrip/cassette or slide/cassette style. They are short and concise, with simplified steps of the jobs to hold the interest of the special needs learner.

Designed to be used in both group and individual instruction, the audiovisuals may be used as a class presentation before or after "hands-on" demonstration of the repair job. If repetition is needed in order for a student to learn the steps of a job, the presentation may also be viewed individually without teacher assistance. For the student who is an auditory learner or blind, listening to the cassettes will be an important aid in that student's ability to learn the repair jobs.

Student Manuals

Accompanying LUBRICATION SYSTEM are three student manuals. These contain numerous illustrations and pictures, with written material on a low reading leval. Each manual has its own performance objective and evaluation chart so that the students can understand what is expected and rate their own progress toward achieving the objective.

Information in Things For You To Know is given in small, sequential segments so that the students are not overwhelmed with the amount of information to be learned. With the short review sections, titled "How Much Do You Remember?" the students can individually learn the information that is grouped together before going on to the next segment of information.

Material covered in Things For You To Know is considered to be the minimum information that a student needs to know about the lubrication system in order to get a small engine repair job. However, for those students who are able to learn and retain more information, it is recommended that the teacher refer to the unit on Lubrication Systems in Comprehensive Small Engine Repair.

Student Manuals 1 and 2 explain in pictures and short sentences the two major repair jobs of lubrication systems. Among the steps of each repair job, specific safety and caution information is frequently noted throughout the manuals. To reinforce consistency in material presented to the slow learner, the pictures and written words correspond exactly with the pictures and wording on the audiovisual presentations.

The three student manuals may be used in several different ways. They may be used as a picture manual by the student, who can look at the pictures while learning the information or doing the steps of the job; they may be used as reading material to reinforce reading skills; or they may be used by the teacher to help explain information or parts of the job that are difficult to understand to see during hands-on demonstration.

Teacher's Guide

The Teacher's Guide was developed with one thought in mind--to help the teacher provide successful learning experiences for the special needs student. Student prerequisite skills have been identified to give the teacher the option of teaching these skills before or during the presentation of LUBRICATION SYSTEM. Objectives are arranged so that they may help the teacher develop Individual Instructional Plans (IIPs). Additional resource material, such as the vocabulary terms, transparency masters, and audiovisual narratives, are given to support the variety of teaching methods.

LUBRICATION SYSTEM may be purchased as an individual instructional package of the Small Engine Repair series, and additional student manuals may be purchased separately.

For further information or comment on LUBRICATION SYSTEM or the Small Engine Repair series, contact the Occupational Curriculum Laboratory, East Texas State University, Commerce, Texas 75428.

ACKNOWLEDGMENTS

Recognition for the successful development of LUBRICATION SYSTEM is given to the Industrial Employers and Teachers Advisory Committee who conscientiously gave of their knowledge and time. Special thanks is extended to the following advisory members:

Charles Francis	Briggs-Stratton Rep.	Wahlburg-McCreary, Inc. Houston
Don Talley	Talley Auto Parts Co.	Commerce
Bill Gray	Bill's Saw Shop	Greenville
Robert Smith	CVAE-GMR	El Paso ISD
Pedro Ruiz	CVAE-GMR	Big Spring ISD
Carl Green	CVAE-GMR	Weatherford ISD
Thaddeus Curry	VEH-GMR	Klein ISD
Robert Svetlik	CVAE-GMR	Hallettsville ISD
Doyle Melton	CVAE-GMR	Austin ISD
Larry Kilbreth	CVAE-GMR	Pampa ISD
Jesse Swindle	CVAE-GMR	North Lamar ISD
Rex Davis	CVAE-GMR	Newton ISD
Fred Grimm	CVAE-GMR	Belton ISD
Vernon McGee	CVAE-GMR	Goose Creek ISD
Chuck Piggott	CVAE-GMR	Lyeford ISD
William Maroney	CVAE-GMR	Alamo Heights ISD
Ignatius Dugosh	CVAE-GMR	East Central ISD

Appreciation is also given to those General Mechanical Repair instructors who field-reviewed LUBRICATION SYSTEM at area in-service meetings in Texas. Their supportive comments, enthusiasm, and suggestions for changes were most valuable in the completion of this project.

The project staff is also indebted to Dr. Max Plata of the Special Education Department, East Texas State University, who assisted in the development of the format for these instructional materials.

Special appreciation is extended to Tom Hill, Vocational Adjustment Coordinator, Commerce ISD, who arranged for some of the vocational students in his class to serve as models in the audiovisual presentations, and who provided valuable insight for assuring that the final product be as realistic and job-oriented as possible for special needs students.

Finally, a big "Thanks" to Tracy Lunceford, the VAC student, who willingly portrayed the small engine mechanic in the audiovisuals.

NOTES TO THE INSTRUCTOR

EQUIPMENT NEEDED

Before using this presentation, arrange to have the following equipment available:

Projector (either carousel slide or filmstrip type)
Carousel tray, if using slides
Projector screen
Cassette recorder
Overhead projector and other equipment necessary for making transparencies
Tools and 4-stroke-cycle gas engines for student use

PREPARATION BEFORE TEACHING THIS INSTRUCTIONAL PACKAGE

Before you begin teaching this instructional package, there are some things you should do:

1. Preview all instructional materials provided (Teacher's Guide, student manuals, and audiovisual presentations). Determine how these will be used in your class.

2. Assess each student for the Student Prerequisite Skills before introducing the instructional package. These prerequisite skills are provided in this guide.

3. Gather additional resources necessary to teach the prerequisite skills to those students who are deficient.

4. Teach the prerequisite skills to those students who need them.

This will help ensure successful learning of LUBRICATION SYSTEM by each student.

STUDENT GOAL AND OBJECTIVES

The student goal and objectives for this instructional package are provided on page 7. These are to assist you in writing each student's Individual Instructional Plan (IIP). The student goal and objectives are also given to the student at the beginning of each student manual. They are titled "The Point of This Booklet" and "What You Will Have to Know and Do." The goal and objectives have been reworded at a level which is understandable to the student.

1. Discuss the goal and objectives with each student so that it is clearly understood what is expected of the student.

2. Add any additional objectives such as the prerequisite skills which need to be learned by the student.

EVALUATION CHARTS

It is encouraged that a grading system not be based on a written test, but rather on individual physical performance of the objectives by each student. Evaluation charts are provided at the end of each student manual. The charts are intended for use as grading instruments and as motivational aids by rating personal progress toward the objectives.

1. Discuss with the students how they will be evaluated, based on individual performance shown by the evaluation charts.

2. See the section titled "Evaluation Model" for specific instructions on how to use the evaluation charts.

TRANSPARENCY MASTERS

Numerous 8½" x 10" illustrations have been provided in the Teacher's Guide to be used in a variety of ways:

1. As transparencies. If so, make an acetate of each illustration so that it may be projected onto a screen, using an overhead projector.

2. Copied and used as hand-outs to students.

3. As review activities; i.e., students are asked to identify items on an illustration in which the names of parts have been erased.

4. As display material for a bulletin board.

INTRODUCTION: THINGS FOR YOU TO KNOW

1. Before introducing the two repair jobs of the lubrication system, first teach the minimum information, safety, and good work habits that are presented.

2. For those students who are able to read and benefit from the activities, provide them with their own manual.

3. Using the transparencies and any additional resource material, teach the information provided in small, sequential steps.

4. Reinforce the learning of this information by having the student complete the activities in the section, "How Much Do You Remember?"

5. Frequently review the information to be learned in short, 15-minute practice sessions that can be spaced throughout other shop activities.

6. Provide for over-learning by giving the student additional reinforcement activities.

7. Make sure the student has mastered previously taught information before introducing new information to be learned.

8. Share with the student's special education teacher Things For You To Know, the transparencies, and the vocabulary terms so that this information can be reinforced with the student.

AUDIOVISUALS AND STUDENT MANUALS 1 AND 2

1. When introducing each of the repair jobs of the lubrication system, use a combination of teacher demonstration, viewing of the audiovisual presentation, and student hands-on experience with a four-stroke-cycle gas engine.

2. Present the steps to each repair job in small, sequenced amounts so that each step is mastered by the student.

3. Have the student who needs additional help view the audiovisual presentation while doing each step of the job on an engine. This can be accomplished by having the student manually advance the cassette and projector once a previously viewed step has been completed by the student on an engine.

4. For those students who are visual learners or able to read on a 4.5 grade reading level, provide them with their own Student Manuals 1 and 2.

5. As the repair jobs are taught and the students practice learning the steps, have the students rate their progress using the evaluation charts found in the back of the student manuals.

6. Share with the student's special education teacher Student Manuals 1 and 2, as reading reinforcement materials to be used by the student.

STUDENT PREREQUISITE SKILLS

Listed below are prerequisite skills which the student needs in order to successfully learn repair jobs on the lubrication system. It is recommended that the instructor teach these skills before or during the student learning of this instructional package.

PREREQUISITE SKILLS	SUGGESTED ACTIVITIES
1. Demonstrates a working knowledge of commonly used vocabulary terms associated with the lubrication system of small gas engines.	Discuss "Vocabulary Terms" provided in the Teacher's Guide; use the "Vocabulary Terms" as a transparency and student handout; provide student drills on the terms; and other teacher-made reinforcement activities.
2. Demonstrates proper use and safety of the following tools socket set ½" open-end wrench oil spout funnel drain pan used oil container flat tip screwdriver wire brush wire feeler gauge	Use Transparency Masters 21 and 22, selected TMs 11-20: "Safety To Follow," and any additional resource material on tools.
3. Matches correct socket and wrenches with the spark plug, bolts, and drain plug.	Provide student with wrenches, a socket set, and a can of nuts and bolts, and instruct the student to find matching pairs. (This gives practice in matching sizes.)
4. Determines whether bolts have a right- or left-hand thread. Correctly threads bolts, and then turns the socket in the correct direction to remove and replace them.	Instruct student to never use a torque wrench on nuts and bolts. Provide student with socket set and bolts mounted on a board for practice.
5. Identifies a small gas engine as a 2-stroke-cycle or 4-stroke-cycle engine and understands the difference in the lubrication method for each.	Instruct student on characteristics of a 2-stroke-cycle and 4-stroke-cycle engine and how each is lubricated, and have student identify the two different engines based on the different characteristics.

PREREQUISITE SKILLS	SUGGESTED ACTIVITIES
6. Adjusts the throttle and starts the engine.	Demonstrate and have student practice adjusting the throttle and starting the engine.
7. Measures a 5-minute time span.	Instruct student on how to tell when 5 minutes have passed on a clock.
8. Reads widths on a wire feeler gauge and understands decimals and place value.	Provide student with wire feeler gauge, and instruct student on reading and understanding the different widths. Provide student with engine parts that have clearances (e.g., spark plugs, breathers) and have student practice measuring them.

STUDENT GOAL AND OBJECTIVES

The following are provided to assist in the development and writing of each student's Individual Instructional Plan (IIP). Built into these objectives is the use of the evaluation charts found at the end of each student manual. You will want to use these charts for monitoring each student's progress toward these objectives. Criterion for competency or the rating that a student must achieve for a pre-determined length of time is suggested as a rating of 3 for three consecutive days on the evaluation charts. See "Evaluation Model", page 61, for further information.

LONG-TERM GOAL: After completing LUBRICATION SYSTEM, the student will be able to identify lubrication information and demonstrate safety, good work habits, and 2 repair jobs on a 4-stroke-cycle small gas engine which are necessary for employment as a small engine mechanic.

SHORT-TERM OBJECTIVES

1. Given information about the lubrication system of small gas engines, the student will understand and explain the following information for three consecutive days:
   - Tell what the lubrication system is
   - Explain why engine parts are lubricated
   - Name the lubricant used in engines
   - Tell the 4 purposes of oil
   - Tell how to find out the kind of oil to use in an engine
   - Tell the meaning of grade and type of oil
   - Tell how often oil should be checked and changed
   - Identify the 3 types of lubrication system
   - Name and find the parts of the lubrication system
   - Tell what the lubrication parts do

ACTIVITIES AND MATERIALS

1. Read or listen to information on the lubrication system, pages 3-43, Things For You To Know.
2. Using transparency masters 1-10, Teacher's Guide, and 3 types of lubrication systems on small gas engines, participate in class discussions and drills on the information to be learned.
3. Answer the review sections on "How Much Do You Remember?" in Things For You To Know.
4. Using the chart, "What Do You Know About the Lubrication System?" pages 44-46, Things For You To Know, rate the student progress for two consecutive weeks or until a rating of 3 for three consecutive days is achieved.

SHORT-TERM OBJECTIVES	ACTIVITIES AND MATERIALS
• Tell what the crankcase breather does • Name and find the parts of the crankcase breather	

NOTE TO THE INSTRUCTOR: Teach each of the above subobjectives separately. Evaluate the student's ability to understand and explain the subobjective before introducing the next one.

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2. Given information on safety and good work habits to follow, the student will demonstrate them most of the time for three consecutive days while doing repair jobs on the lubrication system.	1. Read or listen to information on "Safety to Follow" and "Good Work Habits to Follow," pages 47 and 62, Things For You To Know. 2. Using the transparency masters 11-20, Teacher's Guide, participate in class discussion on the importance of following the safety and good work habits. 3. Answer the review questions on "How Much Do You Remember?" pages 57 and 64, Things For You To Know. 4. Using the chart, "Can You Follow Safety and Good Work Habits?" page 68, Things For You To Know, rate the student progress for two consecutive weeks or until a rating of 3 for three consecutive days is achieved.

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3. Given a 4-stroke-cycle gas engine and the correct tools, the student will check and change the engine oil by correctly following all the steps without help for three consecutive days.	1. Observe the teacher checking and changing the engine oil of a 4-stroke-cycle gas engine. 2. Watch the audiovisual presentation, "Check and Change the Engine Oil," and participate in class discussions on this job.

SHORT-TERM OBJECTIVES	ACTIVITIES AND MATERIALS
	3. Using Student Manual 1, read the words or follow the pictures which describe the steps in checking and changing the engine oil 4. Using a 4-stroke-cycle gas engine and the correct tools, practice the steps in checking and changing the engine oil. 5. Using the chart, "Can You Check and Change the Engine Oil?" page 24 , Student Manual 1, rate the student progress for two consecutive weeks. 6. Repeat above activities (1 through 5) until a rating of 3 on the chart, "Can You Check and Change the Engine Oil?" is achieved for three consecutive days.
4. Given a 4-stroke-cycle gas engine and the correct tools, the student will service the crankcase breather by correctly following all the steps without help for three consecutive days.	1. Observe the teacher servicing the crankcase breather on a 4-stroke-cycle gas engine. 2. Watch the audiovisual presentation, "Service the Crankcase Breather," and participate in class discussion on this job. 3. Using Student Manual 2, read the words or follow the pictures which describe the steps in servicing the crankcase breather. 4. Using a 4-stroke-cycle gas engine and the correct tools, practice the steps in servicing the crankcase breather. 5. Using the chart "Can You Service the Crankcase Breather?" page 25, Student Manual 2, rate the student progress for two consecutive weeks. 6. Repeat above activities (1 through 5) until a rating of 3 on the chart, "Can You Service the Crankcase Breather?" is achieved for three consecutive days.

VOCABULARY TERMS FOR LUBRICATION SYSTEM

The following vocabulary terms are words that are frequently found throughout this instructional package. These terms and their definitions are provided to aid the student in developing a common language that is often used in the small engine repair classroom. For more lubrication system terms that are defined, refer to student manual, Introduction: Things For You To Know.

1. Breather hose--a black rubber, L-shaped hose that connects the breather tube with the carburetor tube.

2. Carburetor--a part of the engine that mixes the gasoline with air to make a fuel mixture that will ignite.

3. Carburetor air cleaner--a part of the engine that cleans the air of dust and dirt before the air goes into the carburetor.

4. Caution--a warning that you should pay attention to and follow or you may break a part of the engine or the tool you are working with.

5. Check--look at something for signs of wear, cracks, or broken parts.

6. Clearance--the space allowed between two parts, such as between the fiber disc valve and the body of the crankcase breather.

7. Crank (as in "crank the engine")--a quick pull of the starter rope to start the engine.

8. Crankcase--housing for the lubricating oil and most of the engine's moving parts like the crankshaft and piston.

9. Engine nameplate--a metal plate on the shroud of an engine that gives you important information about the engine, i.e., the name, model number, serial number, and oil recommendations.

10. Oil chart--a chart that gives different makes of engines and recommends different types and grades of motor oil for various weather temperatures.

11. Oil level measure--a way to see how much oil is in the crankcase to determine whether the engine needs more oil.

12. Overfill--to fill up something until it is so full it might run over the top.

13. Remove--to take something out of or off of the engine.

14. Replace--(a) to take out a worn or broken part of the engine and put in a new part; (b) also to put back an engine part that was not worn or broken.

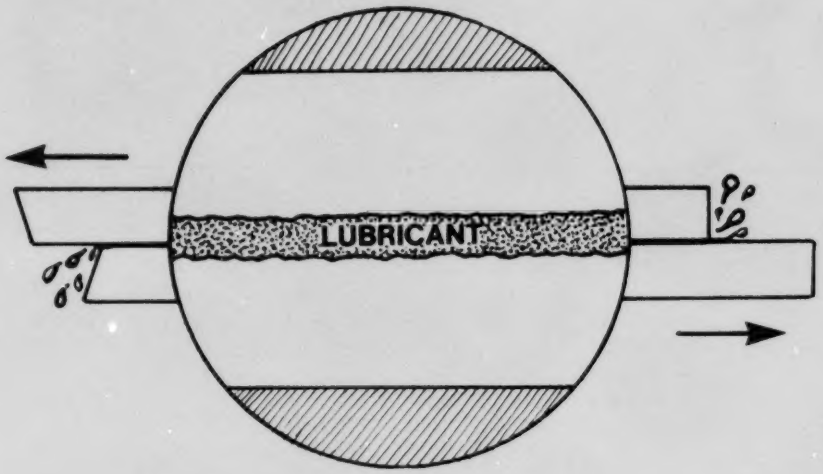
15. Safety tip--a warning that you should pay attention to and follow or you may get hurt.

16. Service--to check and repair and/or replace a part on an engine.

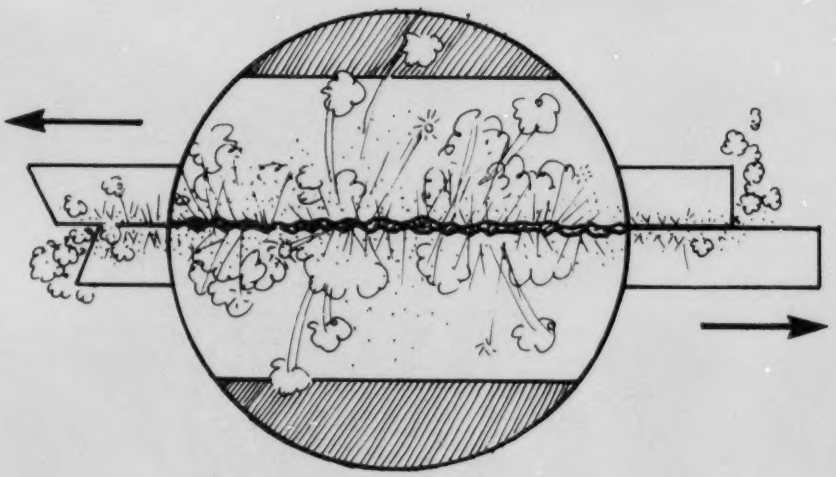
17. Sludge--a thick, muddy mixture of oil, dirt, and other deposits found in the sump.

18. Spark plug--a part of the engine that provides a gap for electricity to jump, producing a spark of fire to ignite the fuel mixture in the combustion chamber.

MOVING ENGINE PARTS THAT ARE LUBRICATED AND NOT LUBRICATED



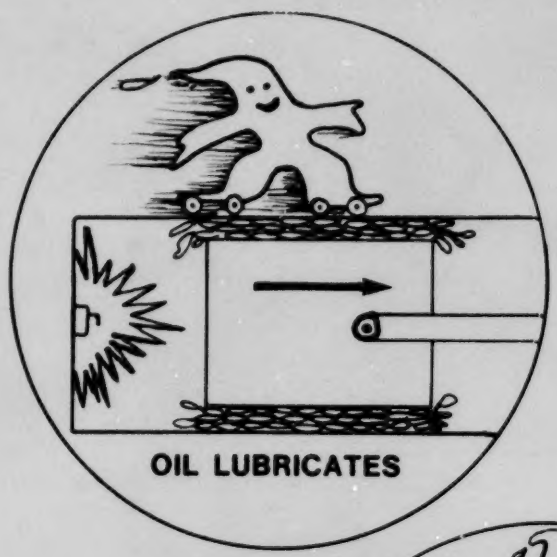
A SLIPPERY, SMOOTH FILM BETWEEN 2 MOVING ENGINE PARTS.

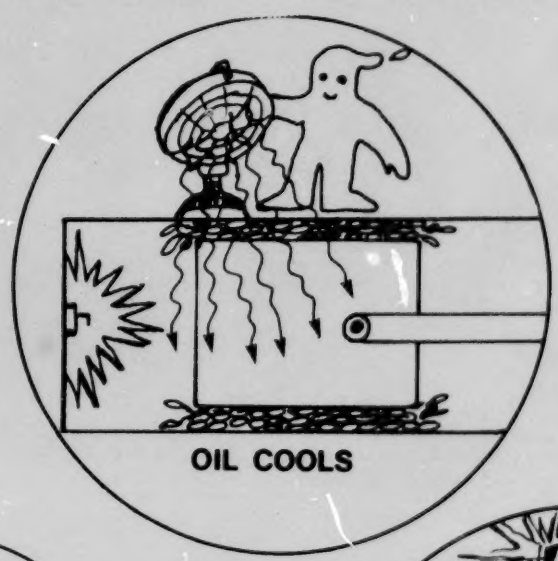


WHEN THERE IS NO LUBRICANT BETWEEN MOVING ENGINE PARTS, FRICTION OCCURS.

TM-1

WHAT OIL DOES FOR AN ENGINE

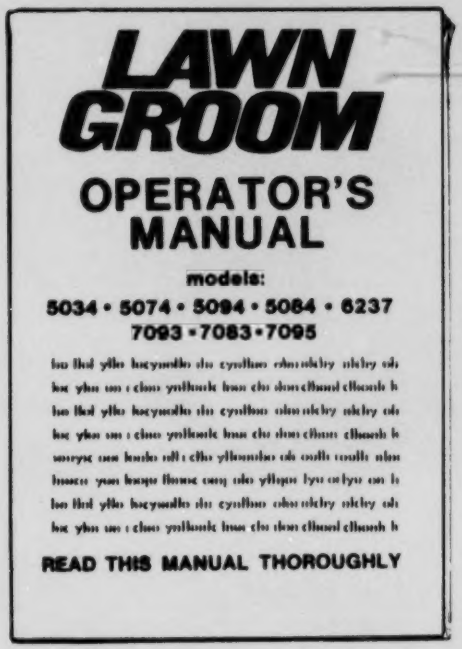




TM-2

15

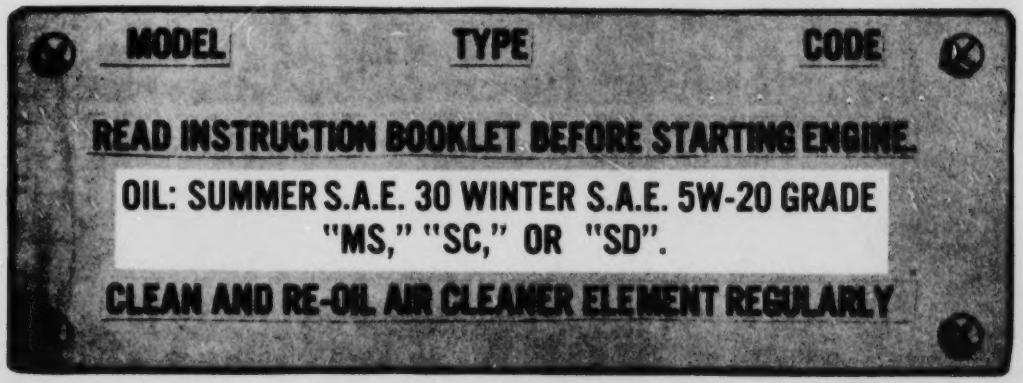
PLACES TO LOOK FOR THE KIND OF OIL TO USE IN AN ENGINE



OPERATOR'S MANUAL

MANUFACTURER	ABOVE 40°F	ABOVE 32°F	BELOW 5°F	BELOW 0°F	BELOW -10°F
Briggs & Stratton	S.A.E. 30 OR 10W-30	5W-20 OR 10W			
Clinton	S.A.E. 30		10W		5W
Kohler	S.A.E. 30		S.A.E. 10W	5W OR 5W 20	
Wisconsen	S.A.E. 30	S.A.E. 20 OR 20W	10W		
Tecumseh	S.A.E. 30		10W-30		

LUBRICATION CHART


MODEL
TYPE
CODE
READ INSTRUCTION BOOKLET BEFORE STARTING ENGINE.
OIL: SUMMER S.A.E. 30 WINTER S.A.E. 5W-20 GRADE
"MS," "SC," OR "SD".
CLEAN AND RE-OIL AIR CLEANER ELEMENT REGULARLY

ENGINE NAMEPLATE

TM-3

TYPICAL MOTOR OIL USED IN MOST SMALL GAS ENGINES

MODEL TYPE CODE

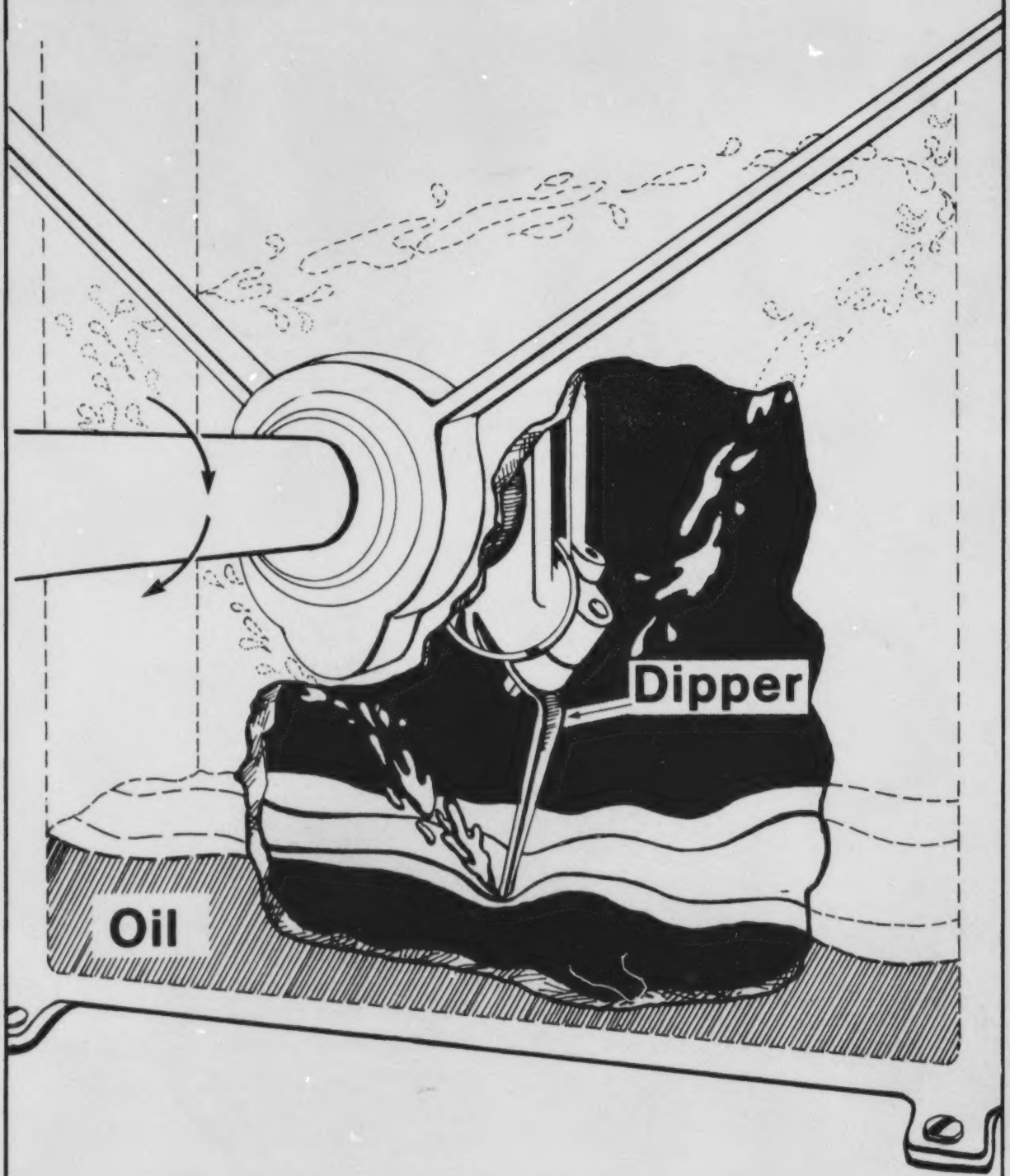
READ INSTRUCTION BOOKLET BEFORE STARTING ENGINE.

OIL: SUMMER S.A.E. 30 WINTER S.A.E. 5W-20 GRADE
"MS," "SC," OR "SD".

CLEAN AND RE-OIL AIR CLEANER ELEMENT REGULARLY

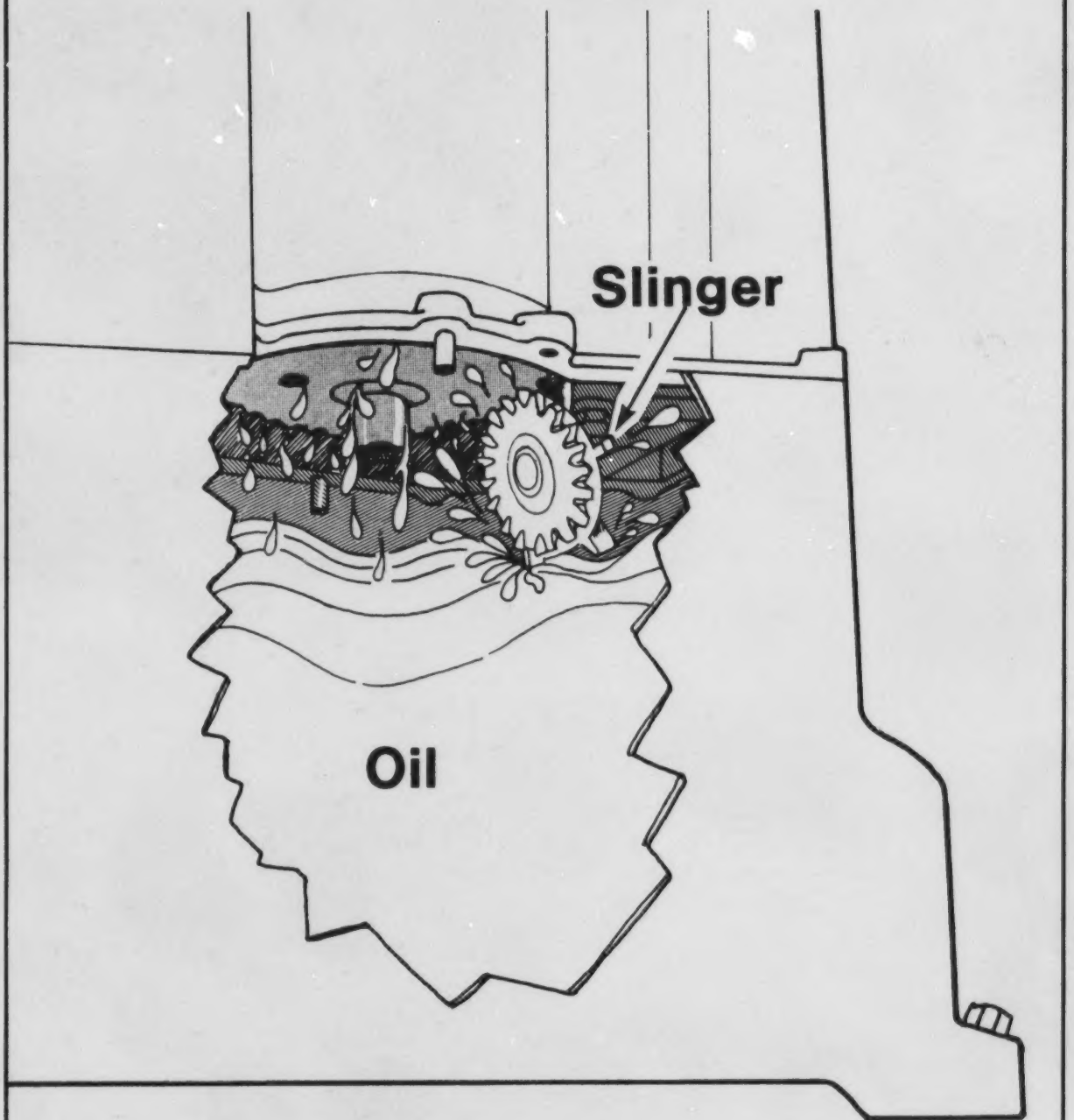
TM-4

DIPPER LUBRICATION SYSTEM



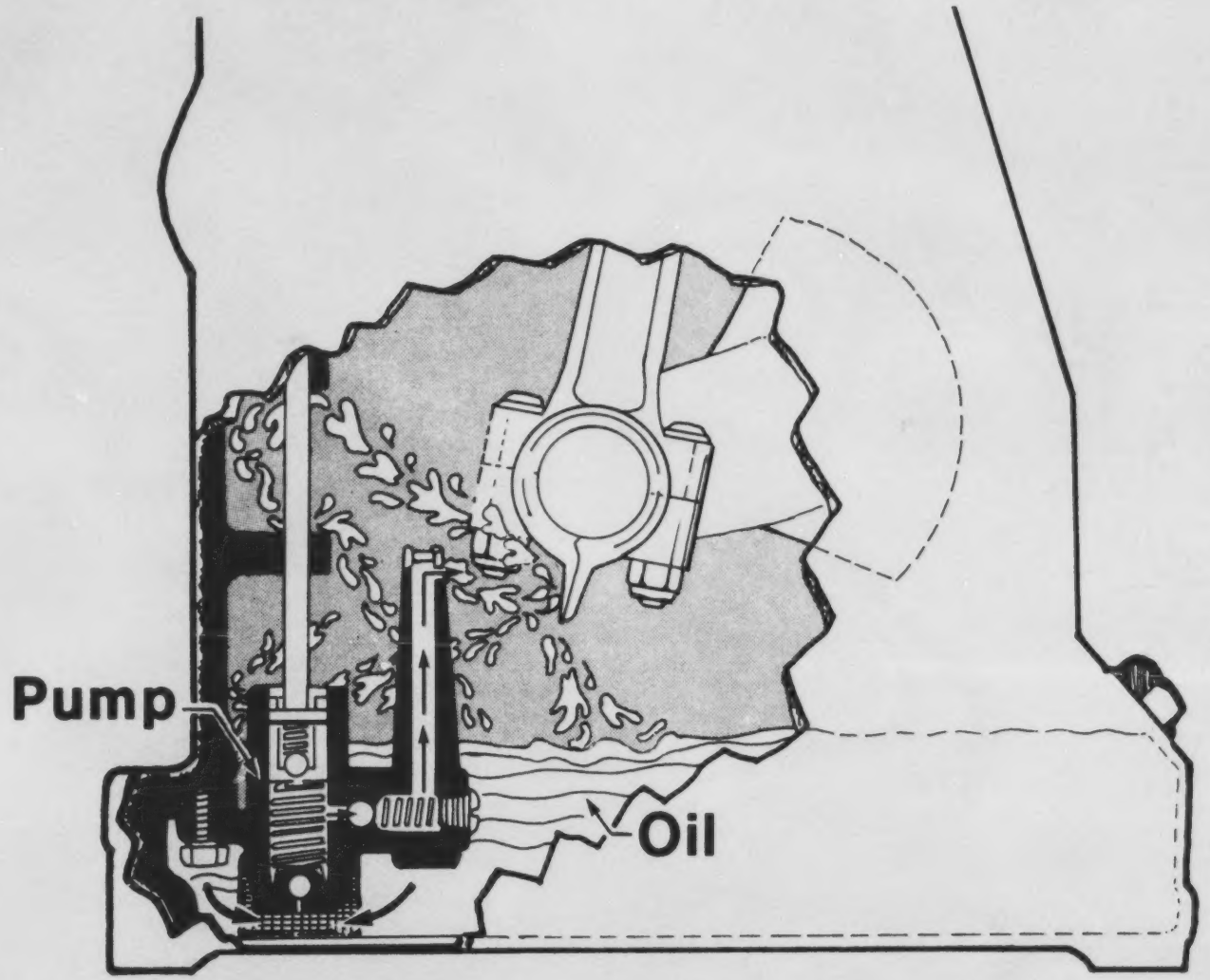
TM-5

SLINGER LUBRICATION SYSTEM



TM-6

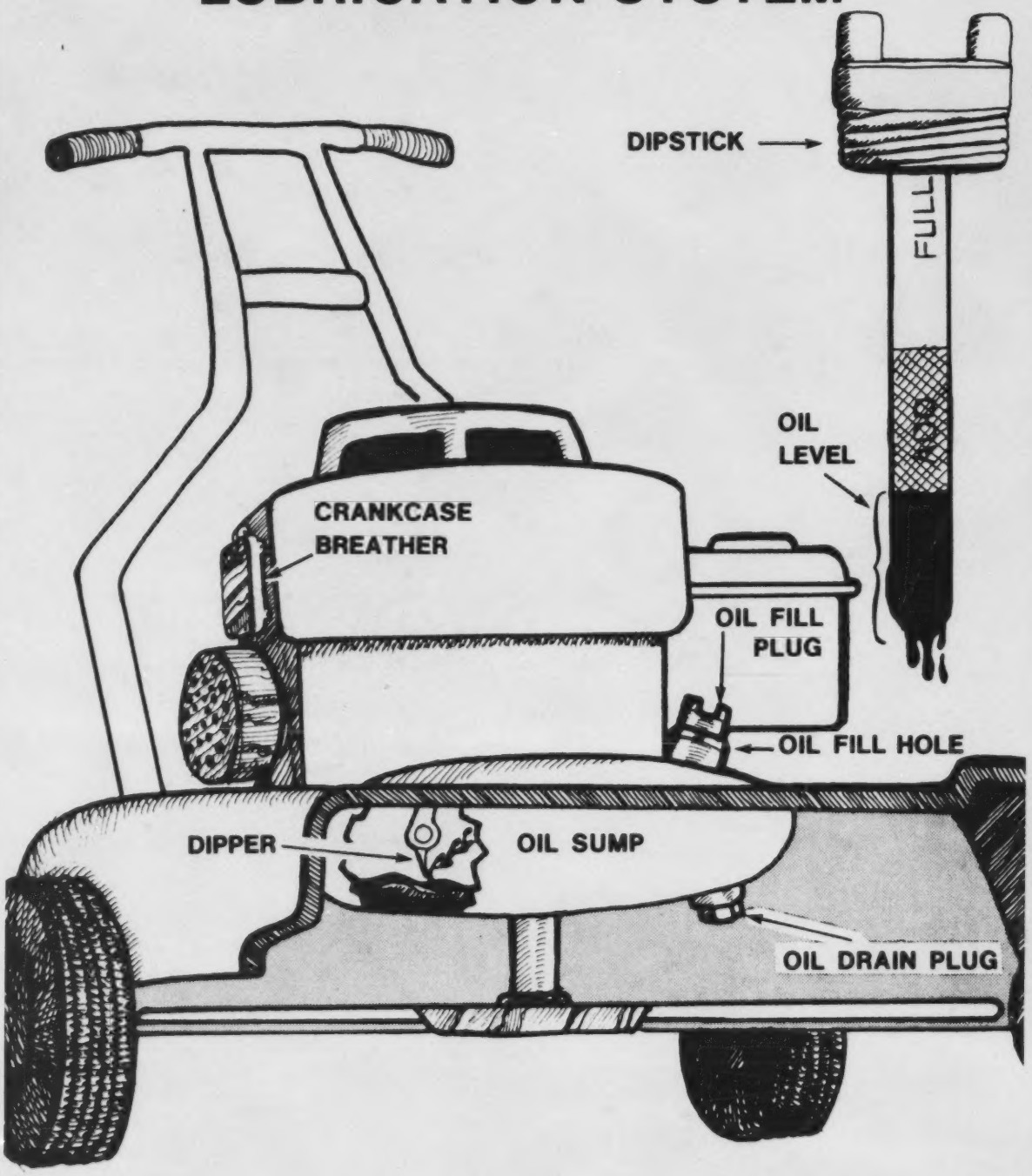
PUMP LUBRICATION SYSTEM



TM-7

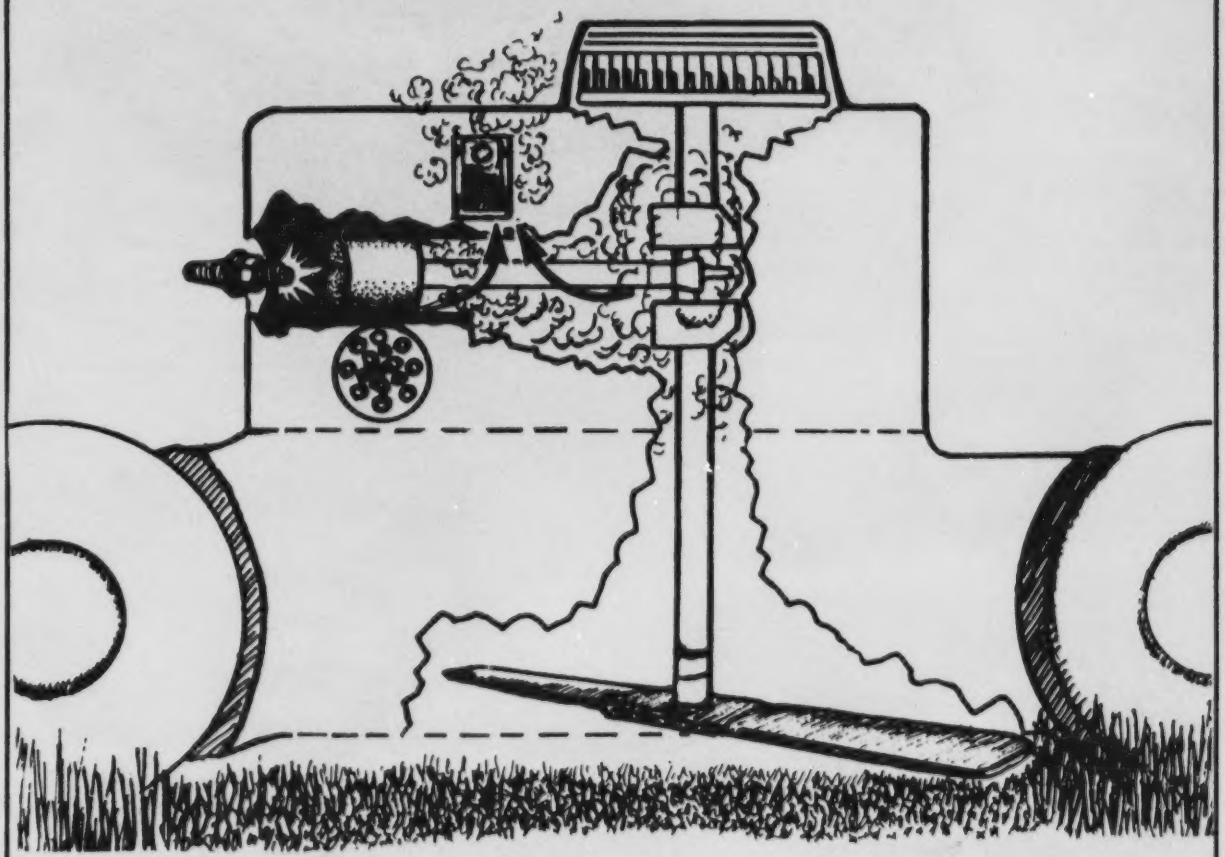
25

PARTS OF THE LUBRICATION SYSTEM



TM-8

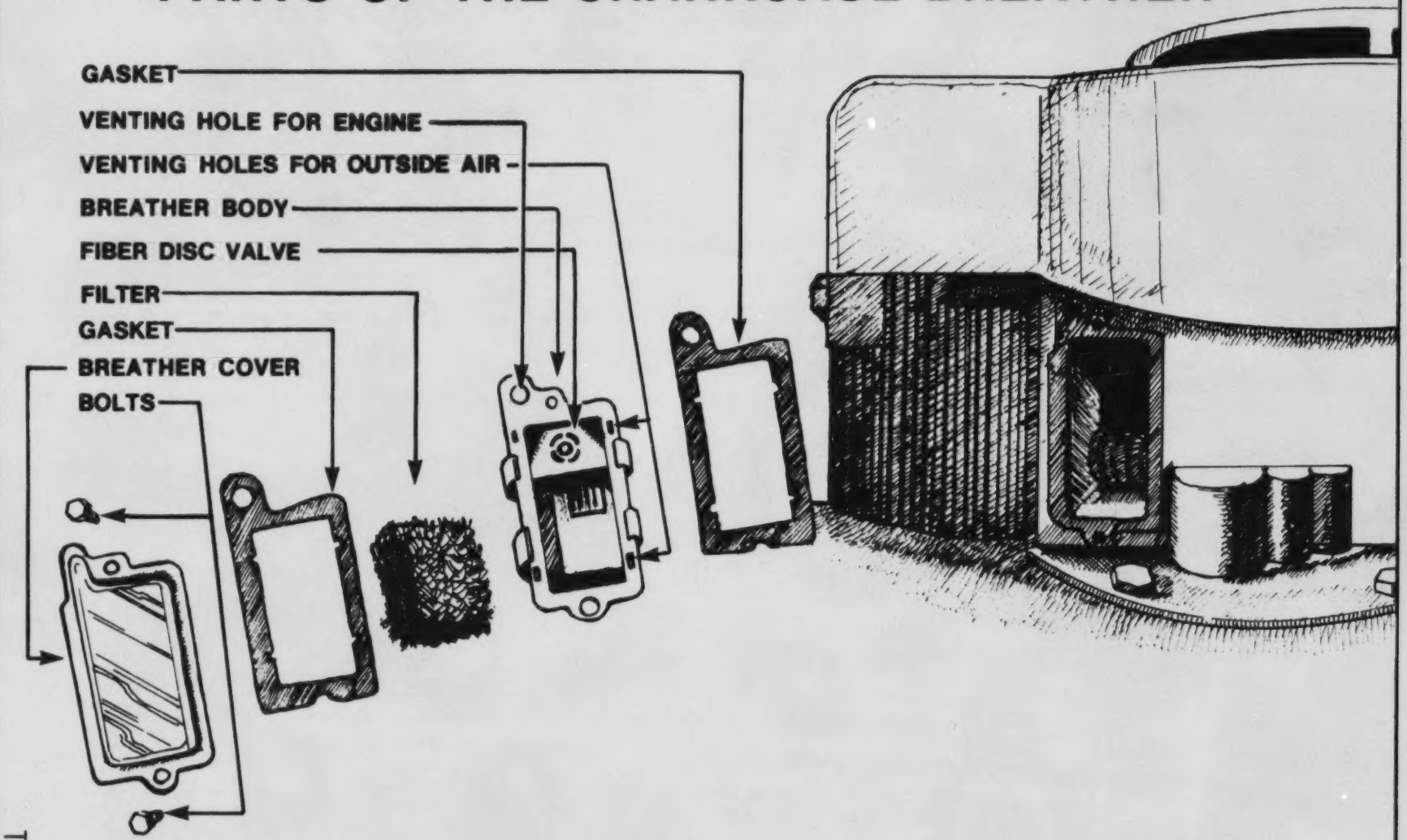
THE CRANKCASE BREATHER



THE CRANKCASE BREATHER LETS THE ENGINE BREATHE OUT HARMFUL GASES

TM-9

PARTS OF THE CRANKCASE BREATHER

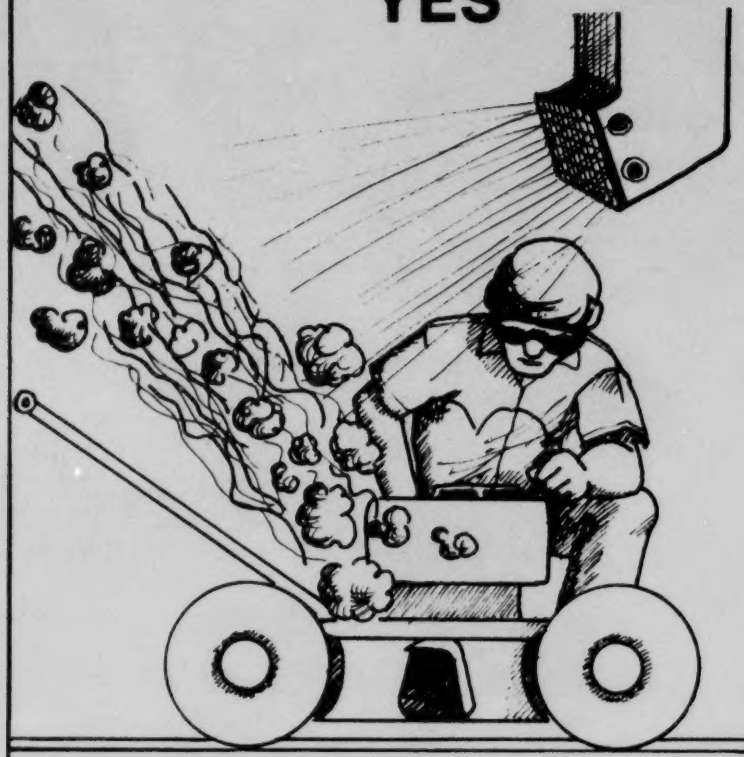


TM-10

31

SAFETY TO FOLLOW

YES



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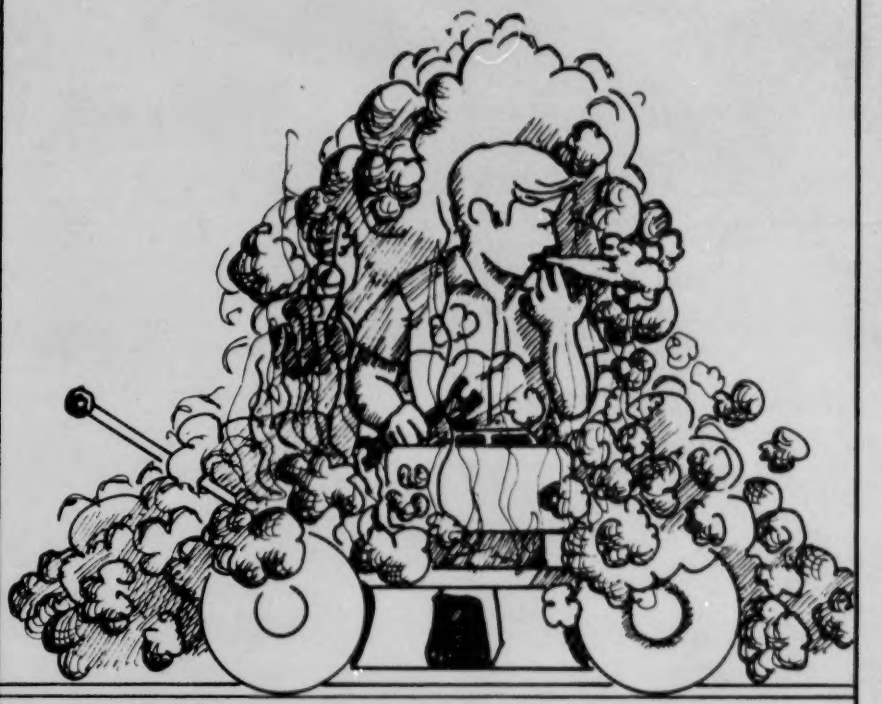


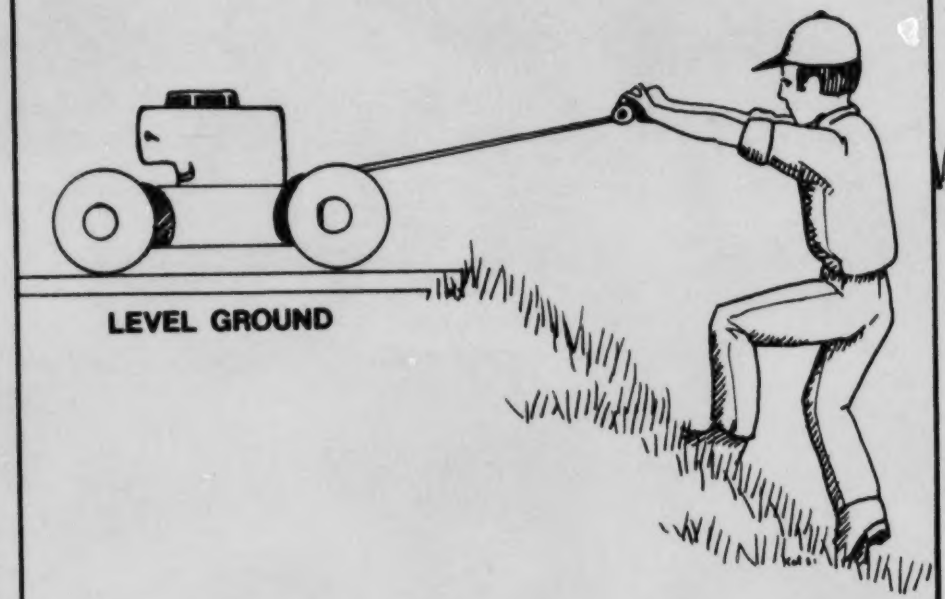
TM-11

BEFORE STARTING THE ENGINE, MOVE IT OUTSIDE OR TO A WELL VENTILATED AREA.

33

SAFETY TO FOLLOW

YES



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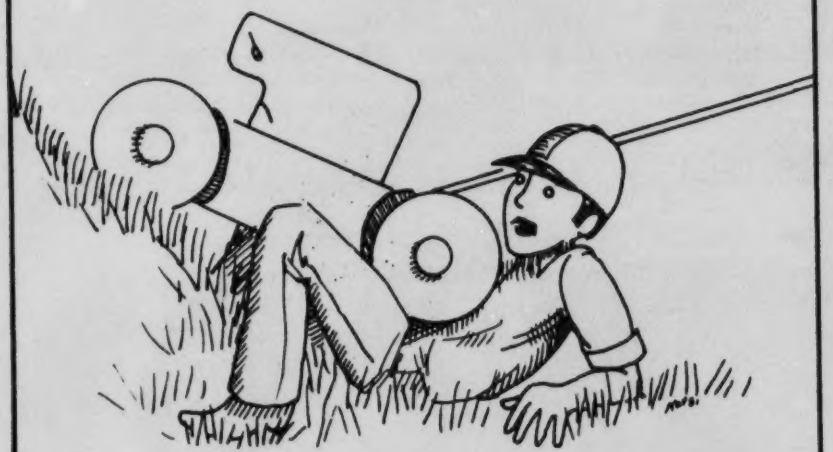


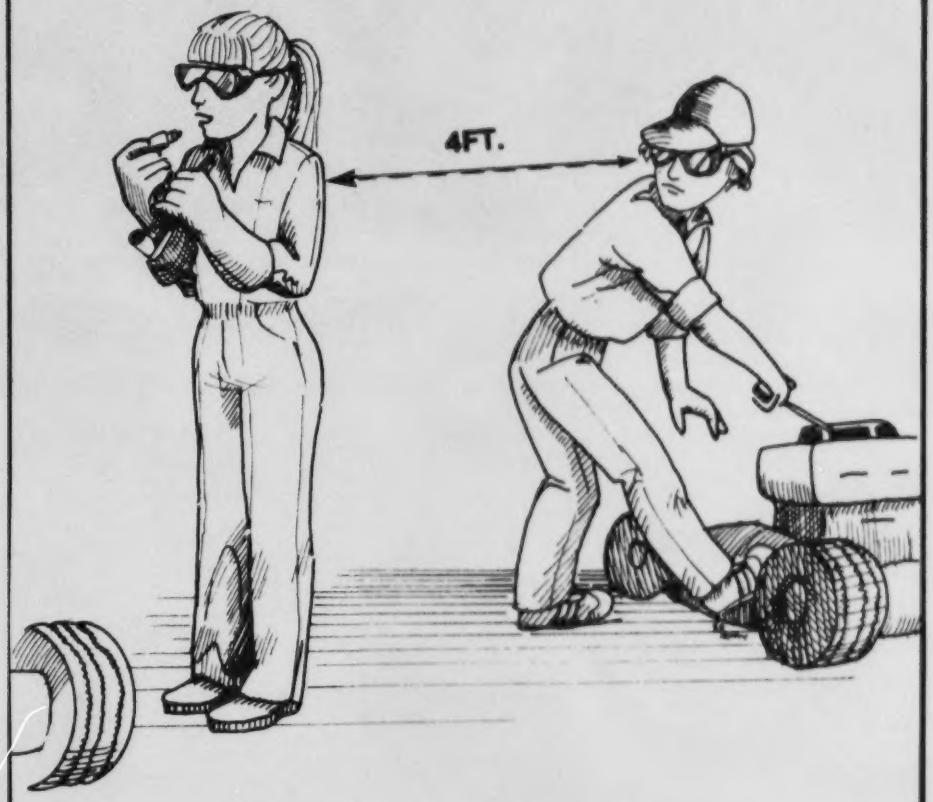
TM-12

BEFORE STARTING THE ENGINE, SEE THAT IT IS ON LEVEL GROUND.

35

SAFETY TO FOLLOW

YES



NO

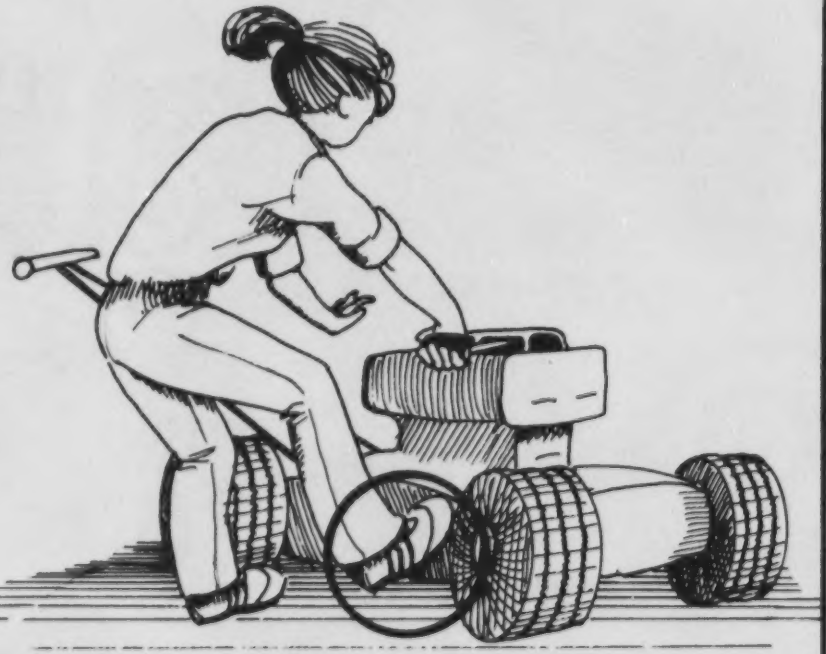
TM-13

LOOK BEHIND YOU BEFORE PULLING THE STARTER ROPE.

37

SAFETY TO FOLLOW

YES



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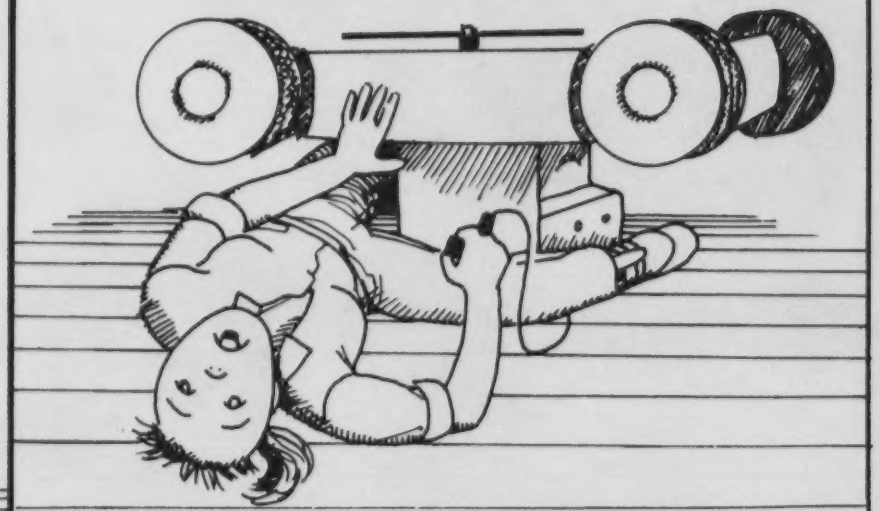


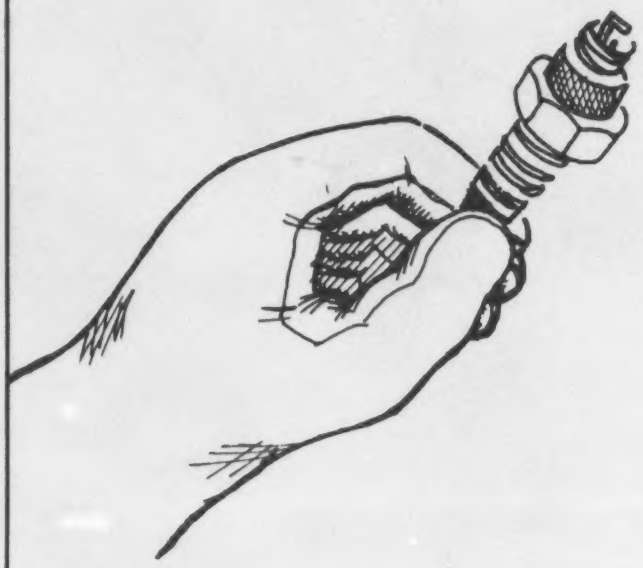
TM-14

PUT ONE FOOT ON THE LAWNMOWER WHEN CRANKING THE ENGINE.

39

SAFETY TO FOLLOW

YES



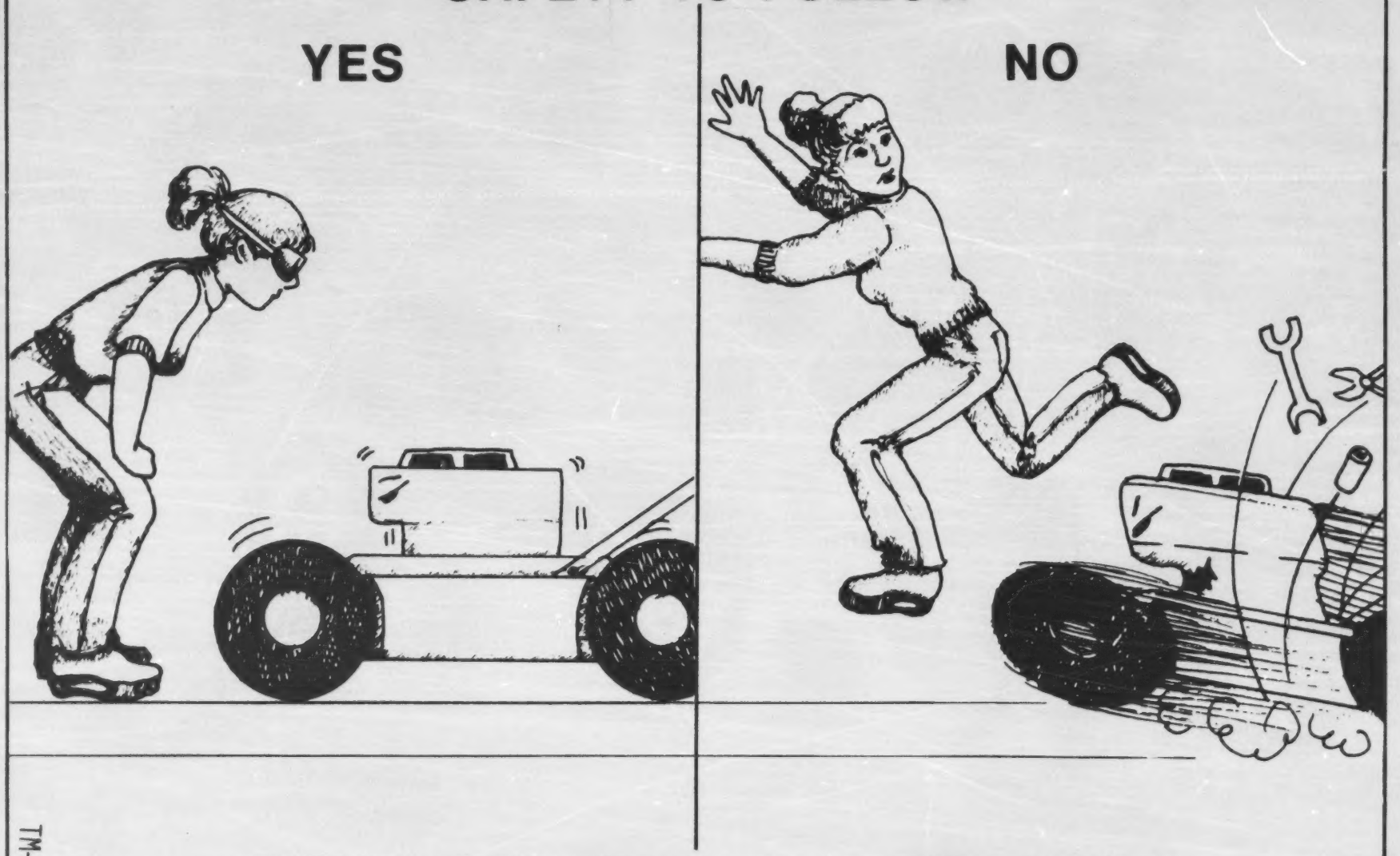
NO

TM-15

ALWAYS REMOVE THE SPARK PLUG BEFORE WORKING ON AN ENGINE.

41

SAFETY TO FOLLOW



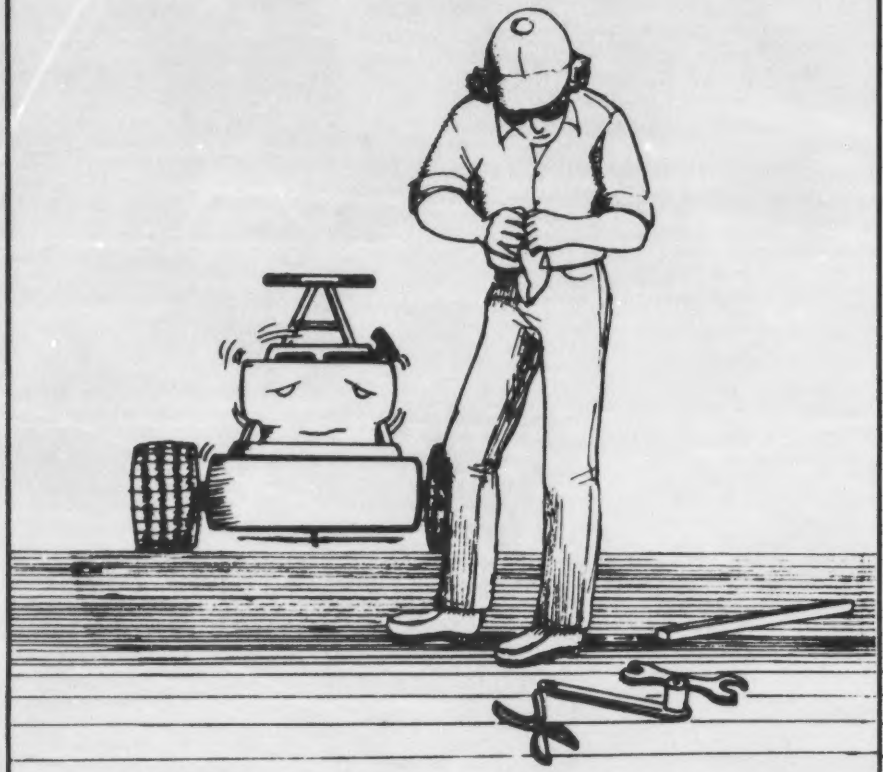
TM-16

ALWAYS WATCH A RUNNING ENGINE. DO NOT LEAVE IT RUNNING UNATTENDED.

43

SAFETY TO FOLLOW

YES



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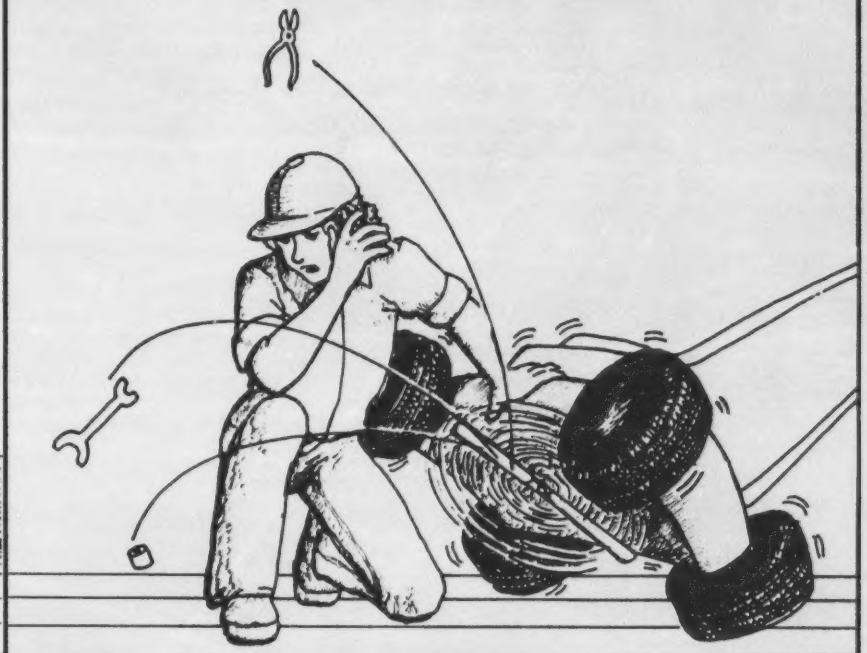


TM-17

WHILE AN ENGINE IS RUNNING, NEVER LIFT UP THE LAWNMOWER, AND KEEP TOOLS, HANDS, AND FEET AWAY FROM THE LAWNMOWER BLADES.

45

SAFETY TO FOLLOW

YES

NO

TM-18

WASH AWAY SPILLED GASOLINE WITH WATER.

47

SAFETY TO FOLLOW

YES

NO

TM-19

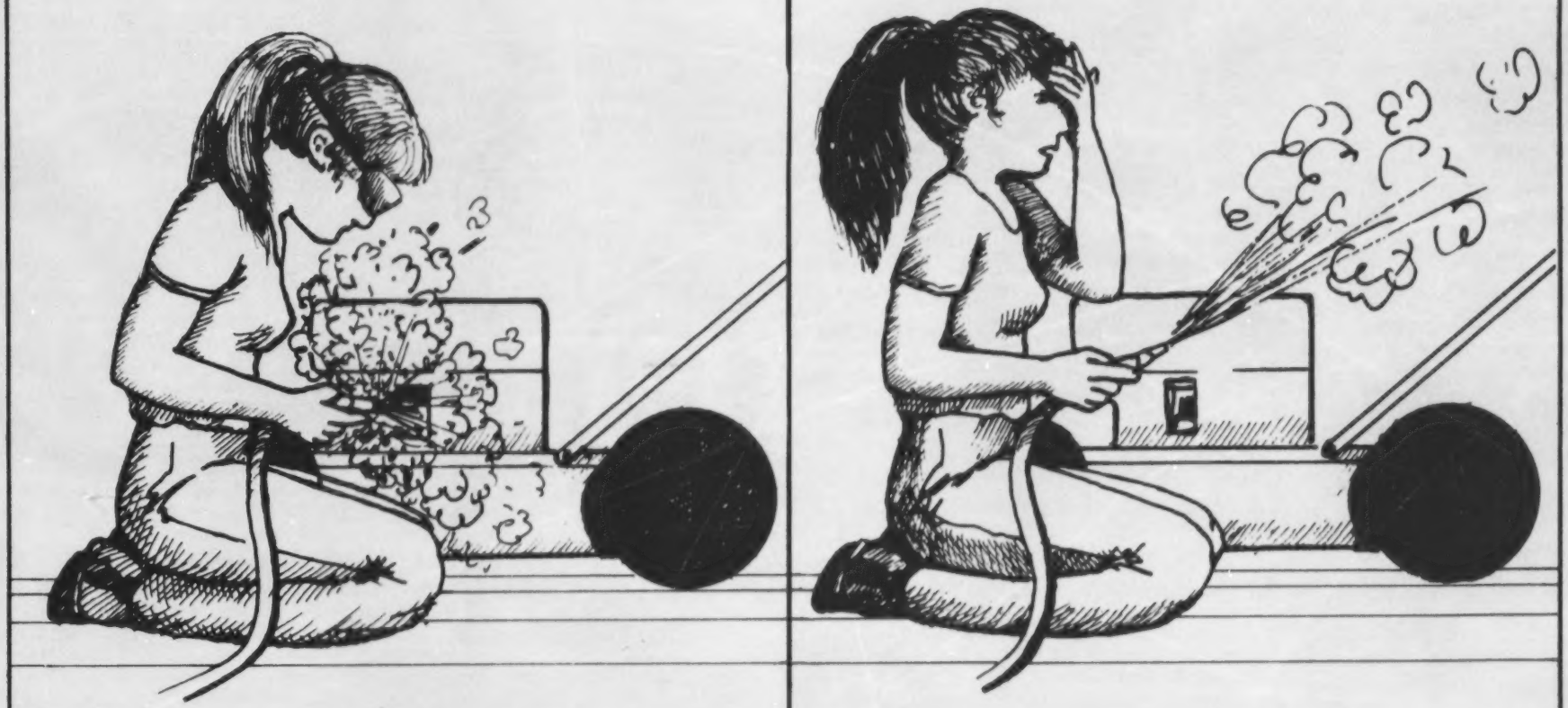
USE SOAP AND WATER TO CLEAN ENGINE PARTS, NOT GASOLINE.

49

SAFETY TO FOLLOW

YES

NO



TM-20

WHEN USING AN AIR HOSE, WEAR YOUR SAFETY GLASSES.

51

TOOLS FOR CHECK AND CHANGE THE ENGINE OIL

SPARK PLUG SOCKET AND RATCHET

OIL SPOUT

2 CANS OF MOTOR OIL

FUNNEL

USED OIL CONTAINER

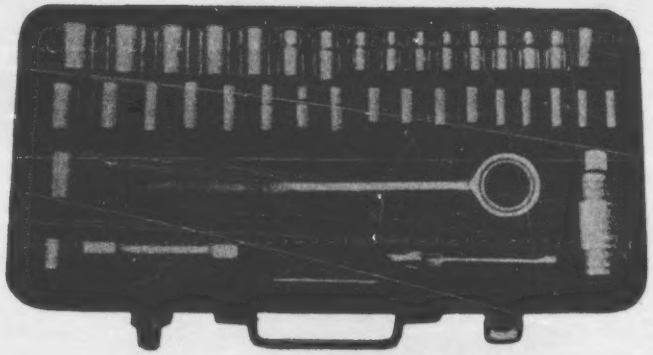
2 OR 3 CLEAN SHOP TOWELS

½" OPEN END WRENCH

DRAIN PAN

TM-21

TOOLS FOR SERVICE THE CRANKCASE BREATHER



SOCKET SET

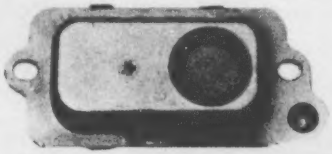
WIRE BRUSH

FLAT TIP SCREWDRIVER

DETERGENT SOAP

2 NEW CRANKCASE BREATHER GASKETS

2 SHOP TOWELS



NEW CRANKCASE BREATHER, IF NEEDED

WIRE FEELER GAUGE

CONTAINER FOR SOAPY WATER

TM-22

55

ANSWERS TO REVIEW MATERIAL IN THINGS FOR YOU TO KNOW

Page 5, What is the LUBRICATION SYSTEM: How Much Do You Remember?

1. a
2. b
3. c
4. b

Page 9, Why are the Engine Parts Lubricated: How Much Do You Remember?

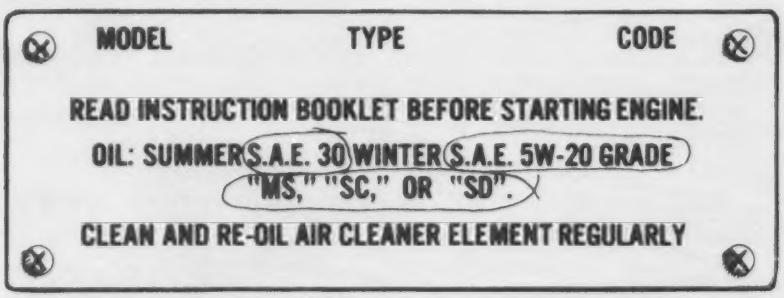
1. c
2. a
3. b
4. c

Page 14, What Is the Lubricant Used in Small Engines and What Does Oil Do For the Engine: How Much Do You Remember?

1. motor oil
2. a. seals in power
   b. cools
   c. gives a slippery and smooth film
   d. cleans

Page 18, How Do You Find Out What Kind of Oil To Use: How Much Do You Remember?

1. b, d, and e
2.

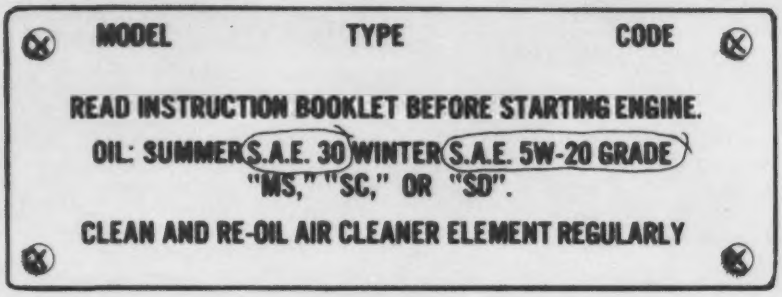

MODEL
TYPE
CODE
READ INSTRUCTION BOOKLET BEFORE STARTING ENGINE.
OIL: SUMMER S.A.E. 30 WINTER S.A.E. 5W-20 GRADE
"MS," "SC," OR "SD".
CLEAN AND RE-OIL AIR CLEANER ELEMENT REGULARLY

3. b
4. b and d

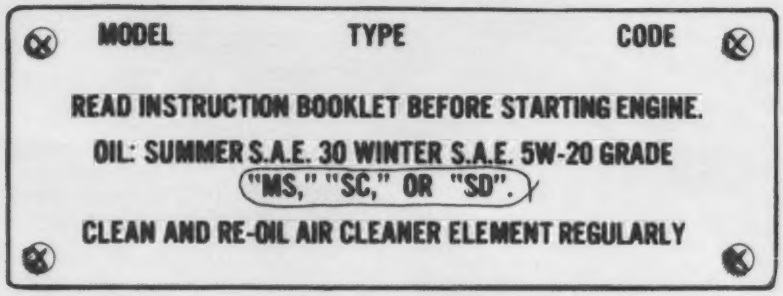
Page 24, What Does Grade and Type of Oil Mean: How Much Do You Remember?

1. c
2. a

3.


MODEL
TYPE
CODE
READ INSTRUCTION BOOKLET BEFORE STARTING ENGINE.
OIL: SUMMER S.A.E. 30 WINTER S.A.E. 5W-20 GRADE
"MS," "SC," OR "SD".
CLEAN AND RE-OIL AIR CLEANER ELEMENT REGULARLY

4. b
5. b
6.


MODEL
TYPE
CODE
READ INSTRUCTION BOOKLET BEFORE STARTING ENGINE.
OIL: SUMMER S.A.E. 30 WINTER S.A.E. 5W-20 GRADE
"MS," "SC," OR "SD".
CLEAN AND RE-OIL AIR CLEANER ELEMENT REGULARLY

Page 28, How Often Should the Oil be Checked and Changed: How Much Do You Remember?

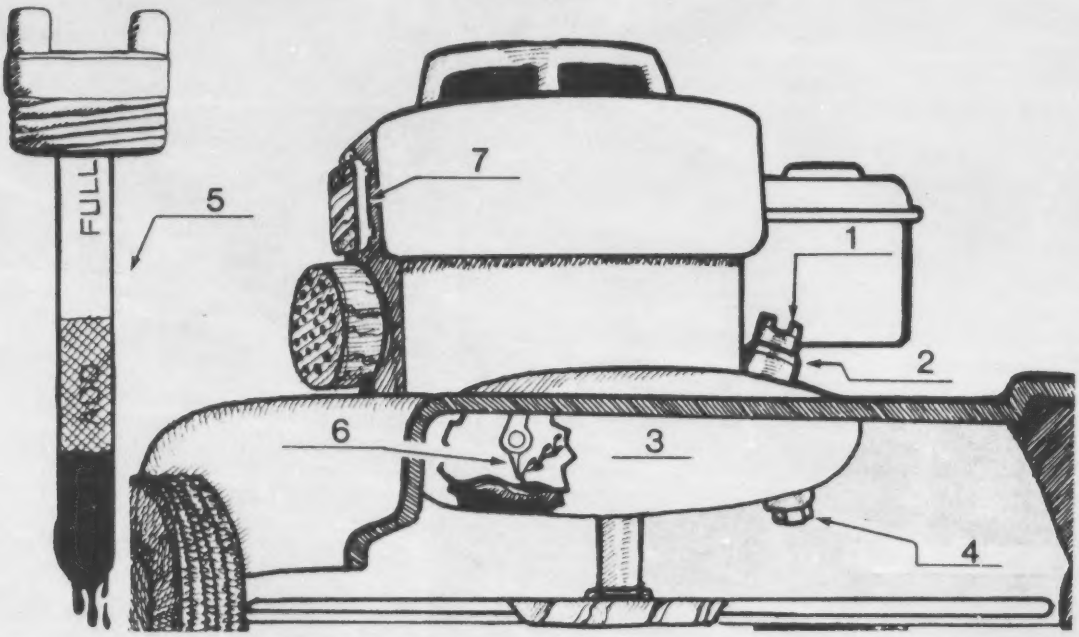
1. c
2. b
3. a

Page 33, What are the 3 Types of Lubrication Systems: How Much Do You Remember?

1. pump
2. dipper
3. slinger

Page 37, What Are the Parts of the Lubrication System and What Do The Lubrication System Parts Do: How Much Do You Remember?

A.



B. Across

2. dipstick
3. dipper
7. hole

Down

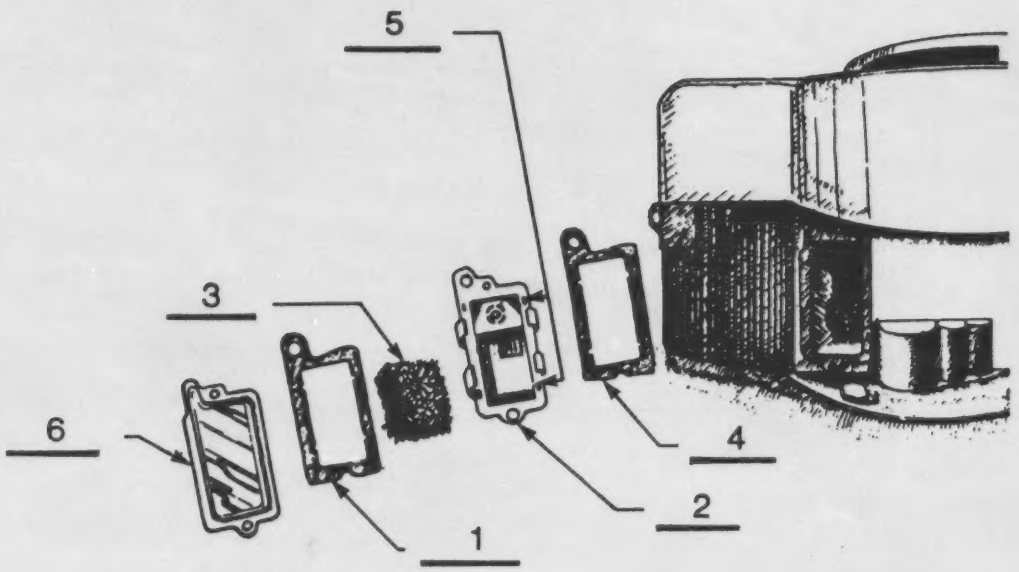
1. oil
3. sump
4. breather
5. drain
6. plug

Page 41, What Does the Crankcase Breather Do: How Much Do You Remember?

✓ 1.	✓ 4.
2.	5.
✓ 3.	✓ 6.

60

Page 43, What Are the Parts of the Crankcase Breather: How Much Do You Remember?



Page 57, Safety to Follow: How Much Do You Remember?

1-10. Evaluated to the satisfaction of the instructor. Students should be able to state in their own words the safety ruld for each picture.

Page 64, Good Work Habits to Follow: How Much Do You Remember?

A.	1.	c	6.	a
	2.	b	7.	c
	3.	a	8.	b
	4.	c	9.	b
	5.	b	10.	a

B. Evaluated to the satisfaction of the instructor based on individual student's participation in the discussion.

EVALUATION MODEL

Evaluation charts are found in the student manuals after each of the sections on "Things to Know," "Safety and Good Work Habits to Follow," and the two repair jobs. These charts are to be used by the teacher as a motivational aid and the students as a self-evaluation of individual progress toward the objectives.

The evaluation charts are designed around an evaluation model that includes the three major areas for vocational competency. These three areas are:

1. Demonstration of knowledge
2. Performance of job skills
3. Demonstration of safety and good work habits

Please note that although each of these three areas are of equal importance for vocational competency, the teaching and evaluating of safety and good work habits to special needs students cannot be overemphasized. Vocational failure of most handicapped students is frequently due to their poor personal and social development.

It is recommended that evaluation of each student's knowledge, job skills, safety, and work habits begin after the student fully understands what is expected and some achievement toward the objective is beginning to show. Because of this, the evaluation period will vary from student to student. Evaluation should last for a minimum period of two weeks or 10 consecutive school days. This length of time will allow most students to overlearn the objectives and thus achieve competency.

The rating scales for the evaluation charts are all similar. They are divided into 3 steps. Generally, these steps are:

RATING		MEANING
1	=	Does not reach the objective.
2	=	Reaches the objective, but needs help or needs to be reminded.
3	=	Reaches the objective without help. Ready for job entry with shop supervision.

Criterion for competency or the rating that a student must achieve for a predetermined length of time is suggested to be a rating of 3 on the evaluation charts for three consecutive days. For example, when a student is able to demonstrate knowledge about the lubrication system or perform safety, work habits, or lubrication repair jobs without help for three consecutive days, then the student has reached criterion and is considered competent in that area.

LUBRICATION SYSTEM: Check and Change the Engine Oil

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
1	(FOCUS SLIDE)	(Music begins)
2	LUBRICATION SYSTEM: Check and Change the Engine Oil	LUBRICATION SYSTEM: Check and Change the Engine Oil. (Music fades out)
3	Mechanic with distressed look on face; lawnmower is overheated	A common problem with the lubrication system of small gasoline engines is that the crankcase oil becomes dirty and some of it is consumed by the engine.
4	Dipstick showing a low oil level | Oil being poured into engine	As a small engine mechanic, you will need to know how to check the oil level and change the crankcase oil.
5	Group tool shot: spark plug socket, ratchet, drain pan, 1/2" open-end wrench, 2 clean shop towels, 2 cans of motor oil, oil spout, funnel	Before you begin, gather all the tools you will need for this job.
6	Spark plug socket, ratchet, and 1/2" open-end wrench	You will need a spark plug socket and ratchet, 1/2" open-end wrench, . . .
7	Drain pan and 2 shop towels	drain pan, and 2 or 3 clean shop towels.
8	2 cans of motor oil, oil spout	You will also need 2 cans of the correct grade and type motor oil, an oil spout, . .
9	Funnel, used oil container	a funnel, and a used oil container for dirty oil.
10	Lawnmower on level ground	To begin, move the lawnmower to level ground so that you will get a correct oil level measure.

63

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
11	Hand removing spark plug wire	Pull off the spark plug wire, . . .
12	Spark plug socket and ratchet removing spark plug. Arrow pointing to left	and remove the spark plug with a spark plug socket and ratchet. Remember to always use the correct tool for removing the spark plug because the plug could easily break.
13	Shop towel wiping dirt away from oil-fill plug	Wipe off the dirt from around the oil-fill plug with a shop towel. This will help keep dirt from falling into the crankcase when the plug is off.
14	Fingers unscrewing oil-fill plug. Arrow pointing to left	Now, unscrew the oil-fill plug.
15	Dipstick coming out of crankcase	If the plug has a dipstick on it, take the dipstick out of the crankcase.
16	Shop towel wiping dipstick	To get a correct oil level measure, first wipe the dipstick with a clean shop towel.
17	Dipstick going into crankcase	Then put the dipstick back into the oil-fill hole. Do not screw or snap on the plug.
18	Dipstick showing oil level below the "Add" mark.	Again take out the dipstick and look at the oil measure on it. If the crankcase is full of oil, the oil level should be between the "Full" and "Add" marks on the dipstick. On this dipstick, the oil level is <u>below</u> the "Add" mark.
19	Close-up of sludge on dipstick	You will also want to check for dirty oil. If the oil is dirty, then its color will be dark. There may also be small pieces of dirt or sludge in the oil, as it is on this dipstick.
20	Oil level at threads of filler hole	If the engine does not have a dipstick, measure the oil level by looking in the fill hole to see if the oil comes to the top of the threads.
21	"CHANGE ENGINE OIL EVERY 25 HOURS OF OPERATION" - - - - - - - - - - - - - - - - - - New oil being poured into fill hole	If the oil is dirty or the engine has been run for about 25 hours since the last oil change, you will want to change the engine oil.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
22	Type and grade of motor oil is identified on engine nameplate	Before changing the oil, check the engine nameplate or an oil chart to see what type and grade motor oil to put into the crankcase.
23	Hand replacing fill plug. Arrow pointing to right	Now, replace the plug snugly onto the fill hole. This will keep dirt from getting into the crankcase, and oil from coming out of the fill hole when the engine is started.
24	Spark plug socket and ratchet replacing spark plug. Arrow pointing to right	Replace the spark plug, . . .
25	Hand replacing spark plug wire	and spark plug wire so that the engine can be started.
26	Mechanic cranking engine. Clock in background	Before draining the old oil out of the crankcase, crank the engine and let it run for 5 minutes because the oil should be hot so that it will easily drain. Remember, a running engine should not be left alone.
27	Hand stopping engine, clock in background showing 5 minutes have passed	When 5 minutes are up, stop the engine . . .
28	Spark plug socket and ratchet removing spark plug. Arrow pointing to left	and again remove the spark plug wire and spark plug.
29	Hand tilting lawnmower	If the drain plug is under the engine, lift the lawnmower on the gas tank side. This will keep the gas tank cap from dripping gasoline.
30	Arrow pointing to drain plug on sump	Find the oil drain plug on the oil sump . . .
31	Hand/shop towel wiping away dirt from drain plug	and use a shop towel to wipe away any dirt around the drain plug.
32	1/2" open-end wrench removing drain plug. Arrow pointing to left	Using a 1/2" open-end wrench, unscrew the drain plug. When removing the drain plug, always use the correct tool, because a tool like pliers will bend the plug out of shape

65

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
33	Hand placing drain pan under drain plug	Now, place a drain pan under the drain plug and lower the engine on top of the pan.
34	Lawnmower on top of drain pan (clock in background)	The oil will then drain out of the sump and into the pan. This will take about 5 minutes.
35	Hand removing drain pan. Clock in background showing that 5 minutes have passed	After 5 minutes, remove the drain pan with the dirty oil in it.
36	Hand replacing drain plug	Replace the drain plug with your fingers, and then tighten it with the open-end wrench.
37	Dirty oil with sludge in drain pan.	Look closely at the dirty oil in the drain pan. If the oil has a lot of sludge in it like this, then the engine may not be in very good condition and may need some other repairs.
38	Dirty oil from drain pan being poured into used oil container	Place the funnel in the used oil container and pour the dirty oil into the funnel and oil container.
39	Hand removing oil-fill plug. Arrow pointing to left	Now, you are ready to put new oil into the crankcase. First, remove the oil-fill plug and set it aside.
40	2 cans of oil. Hand opening one of the cans with an oil spout	Wipe off the tops of the new oil cans and open one of them with an oil spout.
41	Oil spout being placed in fill hole	Carefully place the oil spout in the fill hole and pour the oil into the hole. You may also use the funnel to help you pour the oil in the crankcase.
42	Oil level at top of threads on fill hole	Continue putting in new oil until it reaches the top of the fill hole threads . . .
43	Oil level at the "Full" mark on the dipstick	or to the "Full" mark on the dipstick. You may need to open another can of oil and pour some of it into the crankcase. Remember not to overfill the crankcase because too much oil could be harmful to the engine.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
44	Hand/shop towel wiping around fill hole	Wipe away any oil that spills around the fill hole and replace the plug snugly in the hole.
45	Hand replacing spark plug wire	Replace the spark plug and spark plug wire.
46	Hand cranking engine. Clock in background	Now, crank the engine and let it run for a few minutes so that the oil will settle in the crankcase and you can get a correct oil level measure.
47	Lawnmower has been pushed forward, finger pointing to floor	To see if any oil is leaking from the drain plug, push the lawnmower forward and look at the floor for drops of oil. While the engine is running, do not lift the lawnmower or put your hands under the engine to check the drain plug.
48	Close-up of fill hole	While the engine is still running, also check for oil leaks around the fill hole.
49	Dipstick showing a low oil level / Oil being poured into engine	Stop the engine and recheck the oil level. If the oil is not at the correct level, add more oil, but remember not to overfill.
50	Mechanic picking up tools	When you are through, clean up your work area. Clean and replace the tools in the tool room and put away dirty shop towels and empty oil cans. (Music fades in)
51	Credits	(Music ends)

LUBRICATION SYSTEM: Service the Crankcase Breather

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
1	(FOCUS SLIDE)	(Music begins)
2	LUBRICATION SYSTEM: Service the Crankcase Breather	LUBRICATION SYSTEM: Service the Crankcase Breather. (Music fades out)
3	Mechanic with distressed look on face. Lawnmower is gasping for air	One of the problems with the lubrication system of small gasoline engines is that the crankcase breather will become clogged, and then the engine cannot breathe.
4	Arrow pointing to crankcase breather	As a small engine mechanic, you will need to know how to service the crankcase breather.
5	Group tool shot: socket set, flat tip screwdriver, wire brush, 2 shop towels, wire feeler gauge, detergent soap, water in a container, 2 new crankcase breather gaskets, new crankcase breather	Before you begin, gather all the tools you will need for this job.
6	Socket set, flat tip screwdriver, and wire feeler gauge	You will need a socket set, flat tip screwdriver, and a wire feeler gauge.
7	Detergent soap, water in a cleaning container, wire brush, and 2 shop towels	For cleaning the crankcase breather parts, you will need detergent soap and water in a cleaning container, a wire brush, and 1 or 2 clean shop towels.
8	New breather gaskets and new breather	You will also need 2 new crankcase breather gaskets, or a new crankcase breather, if the fiber disc valve is not working properly.
9	Screwdriver removing bolt from carburetor air cleaner	To check the breather for proper operation, first unscrew the bolt on the carburetor air cleaner with the screwdriver.

69

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
10	Hand removing carburetor air cleaner	Remove the air cleaner. Be careful not to knock any dirt into the carburetor.
11	Hand pulling off breather hose that is connected to the carburetor tube	Carefully pull of one end of the breather hose that is connected to the carburetor tube . . .
12	Hand pulling off breather hose that is connected to breather	and pull off the other end of the hose that is connected to the breather tube. Be careful not to tear the breather hose. Set the hose aside.
13	Fingers replacing bolt on air cleaner	So that the engine can be started, replace the carburetor air cleaner and bolt.
14	Mechanic cranking engine	Now, crank the engine.
15	Finger placed over breather tube	While the engine is running, place your finger over the breather tube. If you feel a suction or pressure on your finger, then the breather is not working properly. It may need to be replaced with a new one.
16	Hand removing spark plug wire	To begin servicing the breather, stop the engine, remove the spark plug wire . . .
17	Spark plug socket and ratchet removing spark plug. Arrow pointing to left	and the spark plug. Remember to use a spark plug socket to remove the plug so that it is not damaged.
18	Socket/nut driver removing 1 bolt from breather. Arrow pointing to the left	Using a 5/16" socket and nut driver, remove the 2 bolts which hold the breather on the crankcase. Set the bolts aside.
19	Hand removing breather from crankcase	Remove the breather from the crankcase . . .
20	Breather with fiber disc valve face-up, .045" wire gauge in other hand near breather	and turn the breather over. To check the correct size of the fiber disc valve, measure the space between the valve and breather body with the .025" and .045" wire gauges.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
21	.045" wire gauge in space between valve and breather body	Do not force the wire gauges into the space. If the gauges fit into the space, then the clearance on the valve is either too small or too large.
22	Old breather in background, new breather close-up	If the valve is completely closed or the gauge fits into the space, then the breather will need to be replaced with a new one.
23	Hand removing outside breather gasket	If the clearance on the valve is correct, then you will want to clean the breather. First, remove the outside gasket and put it in the trash.
24	Wire feeler gauge in one venting hole cleaning out dirt	Place the wire feeler gauge in the venting holes and scrape out any dirt. These holes should be open for draining oil out of the breather and back into the crankcase.
25	Screwdriver pushing up on one bracket	With the screwdriver, push up 2 brackets on one side of the breather, . . .
26	Screwdriver pushing up on breather cover	and carefully open the cover. Slide the cover out from under the other 2 brackets and set the cover aside.
27	Hand removing inside gasket from breather	Remove the inside gasket and put it in the trash. Whenever the breather assembly is opened, always replace this gasket with a new one.
28	Water in cleaning container, detergent being poured into water	Now, mix a small amount of detergent soap and water in a cleaning container.
29	All breather parts in water. Shop towel washing the breather cover in soapy water	Using a clean shop towel, wash the breather cover, . . .
30	Wire brush washing breather body in soapy water	and breather body. Use a wire brush to scrub dirty spots on the breather parts.
31	Fingers squeezing breather filter in soapy water	Wash the breather filter by squeezing soapy water in and out of it several times.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
32	Wet breather parts lying on shop towel. Hand/shop towel drying breather body.	Dry the breather parts with a clean shop towel. An air hose may also be used to dry the parts.
33	Filter being placed in breather body	To assemble the breather parts, first put the filter into the breather body.
34	Breather gasket centered on rim of breather body and under 4 brackets	Place a new breather gasket on top of the body and under the 4 brackets.
35	Breather cover being placed on body	Now, slide the cover on the body and under the 4 brackets.
36	Needle nose pliers pushing down a bracket	Using needle nose pliers, push the 2 open brackets down. Make sure the cover and body are securely tightened together.
37	Hand placing new gasket on outside of breather	Place another new gasket on the outside of the breather.
38	Hand putting breather into crankcase	Put the breather back into the crankcase . . .
39	Socket replacing a bolt on breather. Arrow pointing to right	and replace the 2 bolts on the breather with a 5/16" socket and nut driver. Do not overtighten the bolts because this could damage the breather.
40	Air cleaner being removed	To replace the breather hose, first remove the carburetor air cleaner.
41	Fingers pinching 2 ends of breather hose together	Pinch the 2 ends of the breather hose together so that it will easily fit onto the breather and carburetor tubes.
42	Fingers placing pinched hose on breather and carburetor tubes	Then carefully fit the hose on the breather and carburetor tubes.

SLIDE NO.	SLIDE DESCRIPTION	NARRATIVE
43	Screwdriver tightening bolt on air cleaner	Replace the air cleaner and tighten the bolt with a screwdriver.
44	Spark plug socket and ratchet replacing spark plug. Arrow pointing to right	Replace the spark plug . . .
45	Hand replacing spark plug wire	and spark plug wire.
46	Mechanic cranking engine	Now, crank the engine and let it run for a few minutes. (Sound of running engine)
47	Arrows pointing to areas around the breather where leaks might occur	While the engine is running, check for oil leaks around the breather.
48	Hand shutting off engine	Shut off the engine . . .
49	Mechanic picking up tools from work bench	and clean up the work area. Clean and replace tools in the tool room and put away the dirty shop towels. (Music fades in)
50	Credits	(Music ends)

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